

SCIENCE.

FRIDAY, OCTOBER 15, 1886.

COMMENT AND CRITICISM.

SCHOOLS FOR THE TRAINING of nurses are being organized in every city, and the value of such skilled help is being more and more appreciated by the physician, who, in his busy professional life, cannot make the observations as to the temperature, pulse, and respiration of his patient as often as he would like, or as the welfare of the patient demands. In all these methods, nurses are now trained, and their services are well-nigh indispensable. A trained nurse is, however, an expensive luxury, three dollars a day being the usual price paid them ; so that only the rich can enjoy their educated aid. What is greatly needed in our cities is an organization which will supply such succor to the poor, by whom such services are in reality more needed than by the rich. Every physician whose practice has taken him into tenement-houses has felt the great need of some one to nurse his patients, when, through ignorance or poverty, neither they nor their friends can do any thing to aid him. In Philadelphia a district nurse society has been formed for the care of the sick poor who cannot be sent to the hospital. A trained nurse is provided by this society to visit and attend the sick. Bed-linen and other necessities are also furnished. For these services a charge of five cents a day is made, except when the patient or his relatives cannot afford to pay any thing, in which case every thing is furnished without recompense. The motive which underlies this system is an admirable one, and we shall watch the working of the plan with great interest.

THE BEST METHOD for the disposal of garbage has been a subject of discussion among sanitarians for many years. There is no one system which is equally applicable to all places. In small villages it may with safety be utilized as food for hogs, if proper facilities for the keeping of these animals exist ; but, where there is a population of any considerable magnitude, pig-keeping should be discouraged, and, if need be, prohibited. In small families the kitchen refuse can be burned in the range ; but in large families, hotels and restaurants, this method of garbage disposal is usu-

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ally not feasible. Under such circumstances, it must be removed from the house ; and this is properly the work of the municipal authorities. Boston has undoubtedly the best system for this purpose ; but this is in a large measure due to the favorable construction of the city, by which each block or square is divided by an alley-way, into which the garbage-collector can go, and remove the refuse from the rear of the buildings, and thus avoid carrying the offensive material through the dwelling. In New York and Brooklyn such an arrangement of streets does not exist, and the garbage must therefore be brought through the hallways of the houses. In New York garbage and ashes are placed in the same receptacle, and removed together. In Brooklyn they are removed separately. One of the most disagreeable sights in these two cities is the long line of ash-barrels which line the streets on 'ash days.' Brooklyn is about to make this still more disagreeable by compelling the householder to place his garbage-vessel, usually a soap-box or a tin pan, on the sidewalk in front of his dwelling, there to remain until the proverbially dilatory 'swill-man' comes along to collect it. As this is to be done twice and three times a week, according to the season, the Brooklyn streets will be any thing but attractive to the foot-passenger. There can certainly be but one advantage claimed for this plan, and that is the reduced cost ; but, unless we are much mistaken, the nuisance which will result will make a change imperative.

WE HAVE ALREADY REFERRED to the new objective invented by Professor Abbé of Jena. The German government appropriated fifteen thousand dollars for experimental purposes ; and after five years of work, Professor Abbé produced this new objective, which, it is claimed, more perfectly corrects spherical and chromatic observation than any hitherto manufactured. Some of the lenses in the combination are of siliceous glass, while the others contain borax and phosphorus. The mechanical part of the work was done by Zeiss. We extract the following description of the objective from the *Journal de micrographie*, by Dr. van Heurck : "The objective is homogeneous immersion, of a focal distance of three millimetres,

or about one-eighth English measurement. It is not arranged for cover-glass correction, as this is not necessary, that function being obtained by means of the sliding tube of the body. It contains five lenses, and has a numerical aperture of 1.4, which is a trifle less than has been obtained in England and America (1.5); but, so far as its optical qualities are concerned, it is far superior to any thing ever before made, the new glass permitting the absolute correction of all aberrations. The field is perfectly flat, the minutest object in the extreme edge of the field showing as sharply and clearly as though it were in the centre. With the vertical illuminator, an amphipleura (silvered) is resolved into pearls, — not merely in spots, but over the entire frustule, — and with such clearness that these pearls can be counted. In the study of other diatoms, I have found details which have hitherto escaped notice. As to the bacteria, details of structure are shown that have never before been seen, — details that will without doubt serve to differentiate them by ocular means. Accompanying the objective are three eye-pieces, — two for direct use, and one for photography. They are also made of the new glass and by entirely new formulae."

THE HEALTH COMMISSIONER of Chicago has prohibited the removal of milk from the cow-stables of that city which are infected with contagious pleuro-pneumonia. As was to be expected, the owners rebel, and, unless closely watched, will doubtless smuggle the milk into the market. The New York health authorities are inspecting the beef which comes to the city from Chicago in refrigerator-cars. Thus far no unwholesome meat has been detected. This inspection is of value, as some carcasses may be so diseased as to be detected; but unless the inspection is made at the slaughter-houses, where the viscera can also be examined, no guaranty can be given that the meat is that of a healthy animal. The last report indicated that three thousand animals were under quarantine in Chicago.

THE RECENT DEATH of two persons in a New York hotel from the inhalation of illuminating-gas draws attention again to the dangers connected with this service. Just how the accident occurred has not yet been satisfactorily explained; but it is probable, that, as the victims were city residents, they did not resort to the method of extinguishing the light usually adopted by stran-

gers from the country, namely, by blowing it out. It is more than likely that the flame was a small one, which was either blown out by a current of air, or extinguished by a change of pressure within the pipes. In many occupied buildings the old-fashioned gas-cocks, those without stops, still exist; and it not infrequently happens, that, by an incomplete closure of the outlet, gas escapes into the room, sometimes to a dangerous degree. It would be a valuable improvement in the management of our cities and towns, if it was made the duty of some of the municipal departments to periodically inspect the gas pipes and fixtures of all buildings occupied as residences, with power to compel the owners to provide the most perfect apparatus, or, failing so to do, to be liable to a fine, which could be used by the authorities to do the necessary work themselves. In recent years valuable laws have been passed, regulating the construction and drainage of dwellings, and the same supervision could be advantageously exercised over the arrangement and quality of the gas-pipes and faucets.

THE GERMAN ASSOCIATION OF NATURALISTS AND PHYSICIANS.

THE meetings of the Association of German naturalists and physicians closed this afternoon, very successful according to German, but hardly so according to American notions. The association is a curiosity in itself: for although it now has held its fifty-ninth meeting, and has been in existence since 1822, it has no permanency whatever, but dissolves at the close of every meeting, after it has appointed a president, a vice-president, and a secretary for the next year, and has selected the next meeting-place, which must be the residence of the first and third officer. Into the hands of these gentlemen is given every thing pertaining to the following gathering, which always commences on Sept. 18. The Association of German naturalists and physicians has no corporate existence, owns no property whatever, and meets for the avowed purpose of facilitating acquaintances among the members. Scientific discussions are of secondary importance. For instance: that which a section apparently considers first is, "Where shall we drink our *Früh-schoppen*, and which shall be our *Stamm-kneipe*?" And in the 'Stamm-kneipe,' behind the beer-glass, discussions are held often more profound than those at the official meetings. The advocates of the often-quoted assertion that beer is always injurious will have to acknowledge themselves de-

feated, when they see about five thousand professors, doctors, and students, who gathered here during the past week, all hale and hearty, although many of ripe old age, all of whom drink beer in larger or smaller quantities; and as for the statement that he who 'drinks beer thinks beer,' it is a well-known fact that German thought leads the world in more than one branch of science.

Every naturalist and every physician who has published something in scientific or in medical journals is eligible to membership on the payment of a certain fee: here in Berlin it was placed at fifteen marks. Those who are interested in science, but have not published any thing, can, on payment of the same sum, become associates, but not members; i.e., they are entitled to attend all meetings and entertainments, but are not allowed to vote. No election of members is held: only a simple announcement of the facts, and payment of the fees, are needed to obtain a membership card; and so great and so just is the confidence which these gentlemen place in the applicants' honesty, that cases where membership certificates have been obtained under false pretences are so very few during all these years, that they can be ignored entirely.

The sections, to the number of thirty, have no permanent officers. At every meeting a chairman and a secretary are elected, although the latter generally remains in office during the whole week, because it is his duty to make the necessary report, and collect the abstracts of the papers read before the section, for the 'Tageblatt' of the next day. This *Tageblatt* is a very commendable institution, and takes the place of the 'Daily programmes' of the American association in a very decidedly improved form. It is issued every morning, at about nine o'clock, and contains the membership list, announcements, programme of the day, and *abstracts of all the papers read before all the sections* on the preceding day. This year's *Tageblatt* forms a small quarto volume of four hundred pages.

The registry shows 2,214 members, 1,914 associates, and 1,475 ladies, who are classed by themselves. The position of the ladies in the Association of German naturalists and physicians can, in part at least, be defined by the reproduction of a short abstract from one of the numbers of the *Tageblatt*:—

"His majesty the emperor has been pleased to order a special performance at the Royal opera, as well as at the Royal theatre, exclusively for the entertainment of the Association of German naturalists and physicians. . . . LADIES ARE NOT ADMITTED!"

In view of the large numbers present, there was

nothing wrong in this decree, according to German notions at least; but in view of the fact that at least one-third of the members were natives of Berlin, who could have visited either of the theatres at any other time, it would have been more just if these gentlemen had been excluded. But they were all there as 'invited guests of the emperor' (nothing small, indeed); and many of those who had perhaps travelled from the farthest point of Germany had to take a back seat, and, in addition, leave their wives at the hotels or stay away altogether.

The large number of social entertainments furnished by the local committee as well as by the city government were as complete and elaborate as possible. Excursions, exhibitions, regattas, suppers, balls, etc., gave an abundant opportunity to comply with § 2 of the very short constitution: "The aim of the association is to offer an opportunity to the naturalists and physicians of Germany to form a personal acquaintance."

POHLMAN.

THE MOUNTING OF MUNGO.

THE common practice in mounting large mammals is to first make the legs, and, having fastened them securely to a backbone of plank, to pack the remainder of the body with loose filling. While this does well enough for long-haired animals, whose muscles are concealed, for those that are scantily clad some other methods must be adopted in order to reproduce correctly form and features.

To build up an animal that will be lank and flabby is the height of taxidermic art, and a brief description of the manner in which the elephant Mungo was mounted at the national museum will show the methods by which such results may be obtained.

Mungo was an African elephant about six years old, belonging to Forepaugh's menagerie, that thoughtfully selected Washington as the place of his demise. Mr. William T. Hornaday, the distinguished taxidermist, saw in this event an opportunity of putting the new principles of mounting into practice.

The first step in the process of mounting was to take a series of careful measurements of the body, showing its length, height, and girth at various points, and the dimensions of the limbs and the trunk. These were supplemented by sundry drawings, and by plaster casts of the head and of the limbs of one side. The more care was necessary in this, owing to the fact that the entire skeleton was to be mounted separately, and thus no guide left to the position of the joints. This done, the skin was removed, and transferred to a bath

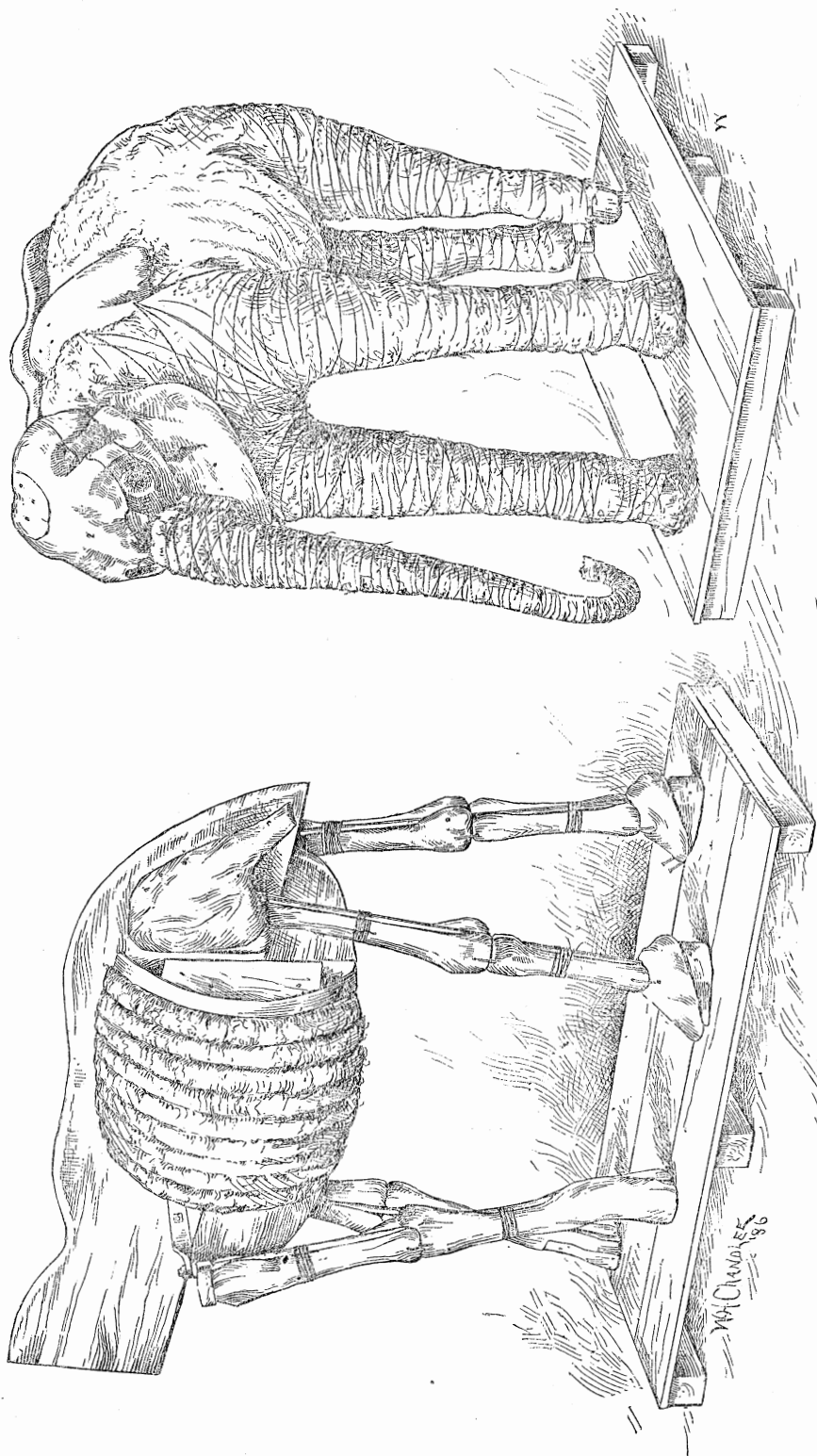


FIG. 1.—SKELETON OF WOOD AND IRON FOR MUNGO, THE BODY WRAPPED WITH ROPES OF TOW.

FIG. 2.—SKULL, BACKBONE, AND SCAPULA OF WOOD, AND WRAPPING OF EXCELSIOR.

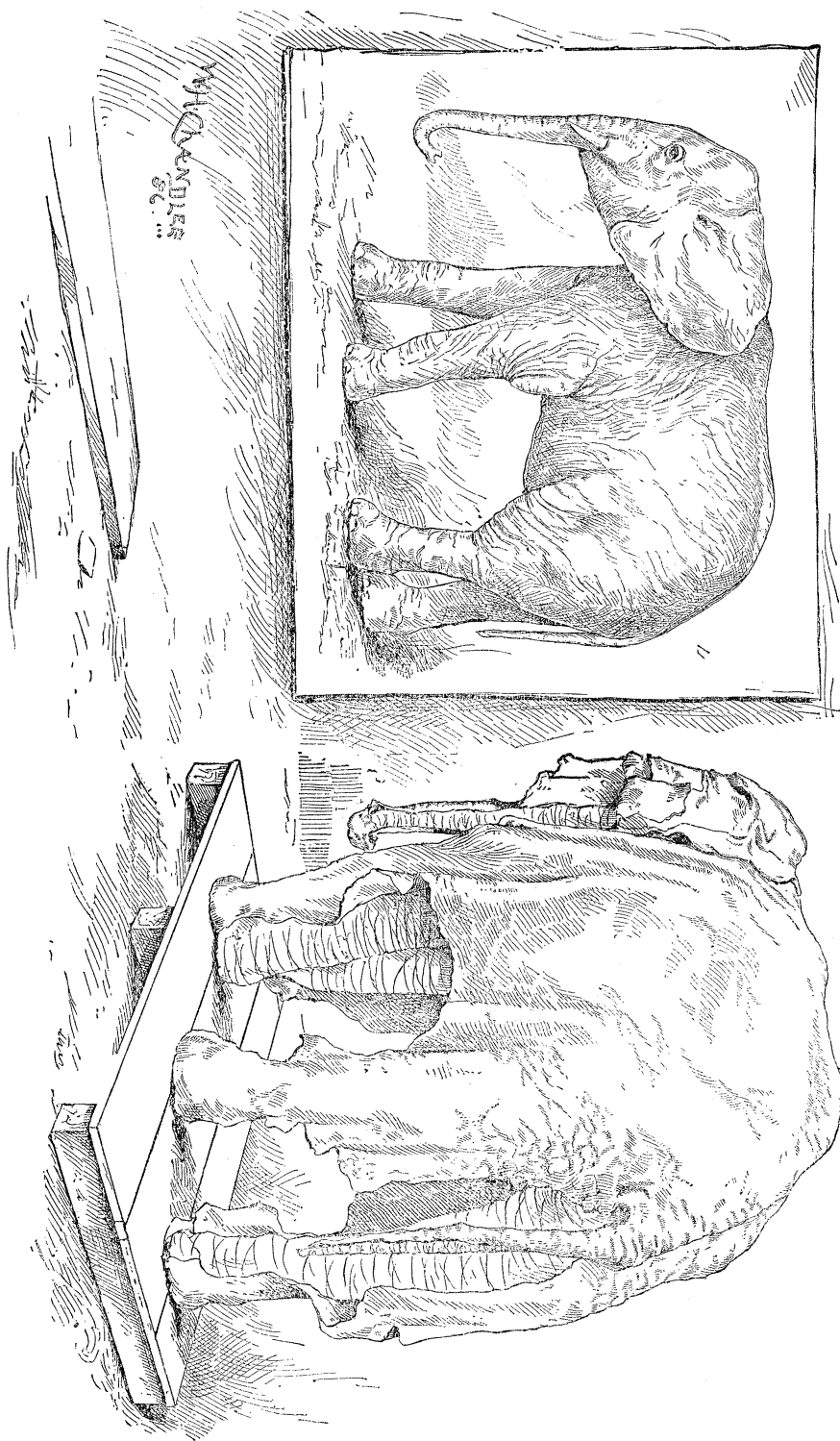


FIG. 4.—MUNGO FINISHED.

FIG. 3.—TRYING ON THE SKIN.

of salt and alum, there to lie until its false body should be ready.

The backbone of this false body (fig. 1) consisted of a broad two-inch plank, the upper edge of which was carefully cut into an exact copy of that dorsal outline which is so characteristic of the African elephant. To this the legs were attached by heavy angle-irons, the iron that formed the axis of the leg running through a hole in the free arm of the L. The legs themselves were formed of excelsior solidly wound around roughly hewn wooden bones.

The accuracy of the work was proved by frequent reference to the measures taken from the dead ani-

measurements, the vacancies existing between the upper parts of the legs and adjacent portions of the body were carefully filled out (fig. 2). Like Mother Rigby's Feathertop, the elephant at this stage stood forth a creature of wood and tow, only waiting for the final metamorphosis which should fill the blank wooden orbits with twinkling eyes, and endow the entire framework with the semblance of life. The thick, stiff skin was now removed from the bath, and carefully thinned down until it had lost half its substance, and become — for an elephant — soft and pliable.

As a careful tailor tries on a partially completed coat to assure himself that the finished garment

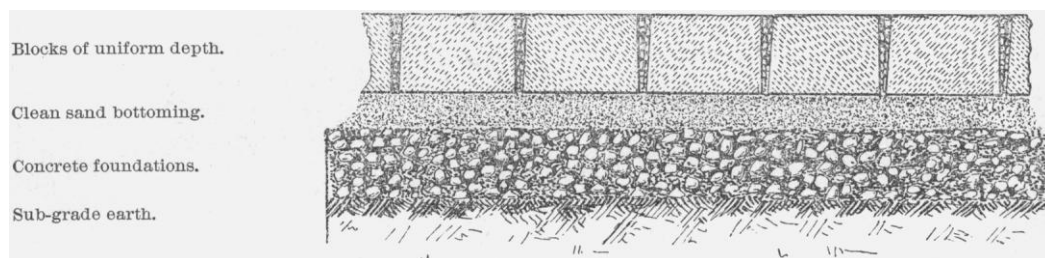


FIG. 1.—PAVEMENT AS CONTRACTED FOR.

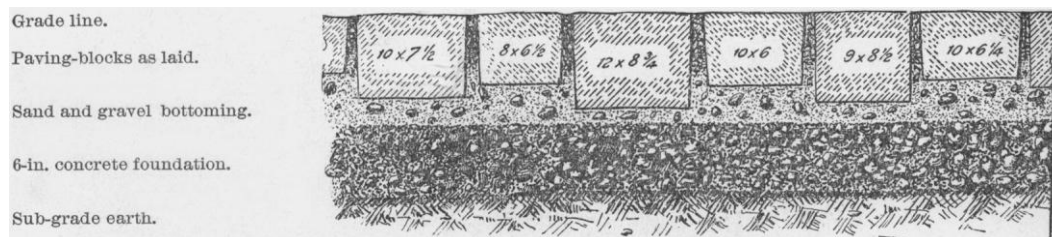


FIG. 2.—PAVEMENT AS LAID.

mal, due allowance being made for the fact that the finished piece would be somewhat larger than its supporting framework. The broad overhanging pelvis was next added; and then the skull, with its massive jaw, was built on, the more salient portions being carved with care from the plaster model, while those buried deeply in the flesh were more roughly copied.

The long ribs of the original were represented by bands of iron wrapped in tow, fastened above to the plank backbone, and below to a second plank shaped to the outline of the under side. A neck of laths, covered with excelsior, joined the head to the body. Wooden shoulder-blades were now put in place, the tail and trunk added, and then, following the diagrams and accompanying

will be a success, so the skin of Mungo was hung upon the manikin (fig. 3). The trial proving satisfactory, the skin was poisoned with arsenical soap, and all was ready for the last act. The skin having been replaced and secured along the back, first one side, then the other, was covered with a thin coating of clay mixed with chopped tow, and the body section sewed up. One by one the legs, trunk, and tail were similarly treated, the skin being covered each night with wet cloths to preserve it moist and flexible throughout. The sewing having been finished, the wrinkles indicated in the skin were followed over with a pointed modelling-tool, thus impressing them deeply in the moist clay, while the deepest wrinkles or thick folds of the trunk, elbows, and flanks, were

secured by wires or twine to hold them in place until dry. Great pains were taken in inserting the eyes,—made from a color-sketch of the originals,—and marking in their surrounding lines, on which depended the expression of the face. After thoroughly drying, all seams were filled with *papier-maché*, while a slight but careful use of color restored the skin to its original aspect (fig. 4).

Thus was Mungo reconstructed, and thus did Mr. Hornaday successfully solve the problem of so mounting an elephant that his hide should appear loose and wrinkled, instead of, as is too often

A FEW WORDS ABOUT PAVEMENTS.

A RECENT report to the commissioners of accounts of this city, prepared by Col. George T. Balch, and relating to a pavement now being laid in Fifth Avenue, shows clearly the difference between pavements scientifically constructed and those with which New-Yorkers are more familiar. The value of the report is enhanced by the judicious use of engravings, some of which are reproduced herewith. Fig. 1 is a transverse section through a pavement constructed in accordance with the specifications prepared by the city

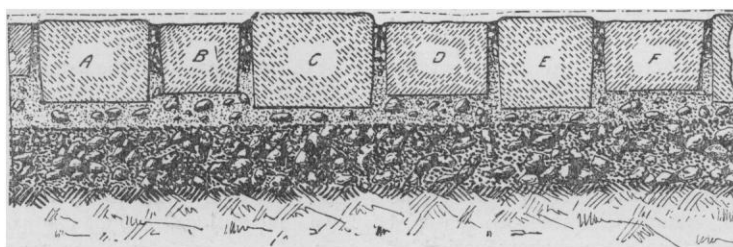


FIG. 3.—PAVEMENT AFTER HEAVY TRAFFIC.

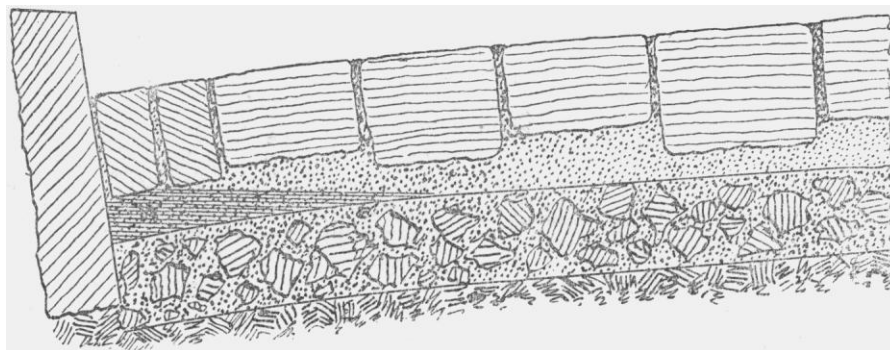


FIG. 4.—EFFECTS OF WET SAND AND LEAKAGE.

the case, smooth and swollen. Mungo was exhibited at the Washington meeting of the Society of American taxidermists, and received the special medal 'for the best piece in the entire exhibition.' This elephant may be said to represent the beginning of the new and better class of taxidermy at the national museum; and although four years ago he stood, as regards quality, almost isolated, he is to-day surrounded by so many pieces of equal merit that we may look hopefully forward to the time when the mounted mammals of the national museum shall be unsurpassed.

FREDERIC A. LUCAS.

authorities. The agreement between the city and the contractor called for sound granite blocks, approximately uniform in size, rammed solidly down upon a bed of sharp, clean, dry sand; the spaces between the blocks to be filled with clean, dry, hard gravel, free from sand, over and through which should be poured hot coal-tar cement. The sand bedding was to rest upon a concrete foundation at least six inches thick, laid upon a well-tamped road-bed. Were the provisions of the agreement carried out, Fifth Avenue would have a pavement nearly perfect of its kind. But, according to Colonel Balch's report, nearly every

provision of the agreement has been violated, and the result is a pavement such as shown in transverse section in fig. 2. The road-bed, or sub-grade of earth, was not excavated to the proper depth, leaving the surface of the pavement at the centre of the street three inches higher than the established grade, making a steepness of crown or arch between curbs detrimental to traffic as compared with a flatter surface, and actually dangerous in icy weather. The surface of the road-bed was not tamped; the concrete ranges in thickness from the stipulated six inches down to three, and in some places even two inches; it was not properly mixed, laid, or tamped; and the materials of which it is composed are inferior in quality. The granite blocks vary greatly in size, and are bedded in a mixture of sand and gravel. They are laid with the broadest edge upward, instead of the reverse; the filling between them is a mixture of sand and gravel; and the paving cement, instead of filling the interstices to the bottom of the block, extends only an inch or two below the surface. In fact, so imperfect are both material and workmanship, that, after a short period of heavy traffic, the pavement will present the appearance shown in fig. 3. All sand and gravel used should have been free from moisture, artificially dried if necessary, and the joints between the blocks should be water-tight. These conditions were violated, and the collection of water at *W* in fig. 4 shows the effect of damp bedding and leaking joints. As a result, the tremendous pressure due to the expansive force of the freezing of this water in cold weather may be expected to rupture the pavement at the point where the water collects.

ST. PETERSBURG LETTER.

RUSSIAN science has sustained a heavy loss by the death of A. M. Butlerow, the celebrated chemist, in August last: it is the greater, as he was yet in the prime of life. His chemical work is well known abroad, but it may not be known that he had a second specialty: he was an eminent apiculturist. The progress in bee-keeping made in the last years in Russia owes much to his untiring efforts, especially to his manuals and papers. By his death the second chemical seat is made vacant in the Academy of sciences; and various surmises are made as to whether this learned corporation will persist in its opposition to the election of the greatest of Russian chemists, Professor Mindeff.

Professor Mindeff has twice visited the petroleum district near Baku, on a mission of the Ministry of finance, principally with a view to ascertaining if the wells were rapidly giving out or

not. He has not yet returned from his last journey. Great progress is said to have been made in the distillation of petroleum oils by G. W. Alexeyew.

It being now early in the season, news about geographical expeditions is yet scarce. Prjevalsky is still at his country-seat, working at the report of his last journey, which is to be ready in August next. The special reports on botany, different parts of zoölogy, and probably also geology, it will take a long time to complete. The only special report which is to appear sooner is that on meteorology. The observations during the last expedition will be printed *in extenso*, together with those made during the Lob-Nor and the second Tibet expeditions of the same traveller, and the itineraries of the same. The work is to be supervised by Prof. A. Woeikof, who will add to it a work on the climate of the countries traversed, and High Asia in general.

The Russian polar commission has printed the observations of the first year (1882-83) of the Lena expeditions, which comprise meteorology only. The work of the second year, as well as the calculation of the magnetical observations, is in preparation. The work of the Lena expedition is of the highest character, and does the greater honor to its members, as it was done under the most serious difficulties.

Great progress in meteorological work in the south of Russia has been made. Professor Klossowsky, in Odessa, has succeeded in establishing quite a number of rainfall and thunder-storm stations in the government of Kherson, one of the most extensive in the south, and will issue a monthly report. This year was remarkable for heavy rains, especially in the southern part of the government. The rains have also extended to the central and eastern parts of Russia, and seldom have so heavy rainfalls been experienced on one day in this country. Till this year, over one hundred millimetres fell on one day at but two places in the plains of European Russia,—145 in the southern part of the government of Tula, July 12, 1882; and over 120 at Yelisavetgrad. This summer we had 132 at Kharkow, June 24; 102 at Lgow (government of Koorsk), July 30-31 (of these, 51 in one hour); 99 at Moscow, Aug. 9-10; 93 at Kamishin, July 28. The rain of Aug. 9-10 was very heavy over a great district, and caused high water in the right tributaries of the Moskwa and Oka. The railroad-bridge over the Lopassnja was washed away.

Captain Makarow, I.R.N., has published an important work, "On the interchange of waters of the Black and Mediterranean seas." By the use of an instrument called a 'fluctometer,'

and invented by him, he could determine the velocity of currents irrespective of their direction. This instrument showed him that in the Bosphorus and Dardanelles the velocity decreased from a little below the surface, became 0 at a certain depth, and then increased again. As the surface current is from the Black Sea to the Sea of Marmora, and from the latter to the Mediterranean, the lower currents must be in the opposite direction; i.e., bringing the salter and warmer water of the Mediterranean to the Black Sea. This was also proved by determinations of specific gravity of the water, which considerably increased once the lower current was reached: for example, five miles from the Black Sea, in the Bosphorus, at 20 fathoms depth, the specific gravity was 1.0146; at 23 fathoms, 1.0225. In the Black Sea, in the vicinity of the Bosphorus, he found water with a temperature above 11° C., even at the depth of 140 fathoms; and 10.5° at 260 fathoms. The observations of Professor Lapschine off the east coast of the Black Sea (latitude 43° – $44\frac{1}{2}^{\circ}$) give a temperature of 10° at 200 fathoms, and 8° at 490 fathoms.

O. E.

St. Petersburg, Sept. 25.

NOTES AND NEWS.

THE *Alert* returned to Halifax Oct. 10, after an absence of nearly four months. This was the final trip of the *Alert* to the Hudson's Bay region, all the observing stations being dismantled, and the observers, their instruments, and other property brought back to Halifax. She sailed from Halifax on June 24, and proceeded direct to Nachvak station. On arrival off the station, the ice was so thick that the steamer could not get in to the coast. She then pushed on to the entrance to the straits, and, after encountering much trouble from ice, a clear entrance was found near the north side. No ice was encountered again until North Bluff was reached, and in making from that point to Diggs seven or eight days were occupied. At Diggs the *Alert* remained a couple of days, making repairs and receiving a general overhauling. During this time the propeller, from which a blade had been lost in the ice, was fixed. On the fourth day the expedition was continued to Churchill, that point being reached at the end of July. Churchill harbor was surveyed, and was found to be a splendid harboring-place, with not less than twenty-four feet of water at dead low spring tide. York Factory was reached two days after leaving Churchill, the length of the trip being occasioned by delays by a thick fog. Here a reconnaissance survey was made of the estuary of the Nelson River. The

water was so shoal at such a distance from land, that a vessel could be in only five fathoms of water, and at the same time land could not be sighted from her deck. The roadstead affords a very unsafe anchorage, and the channel of the river is narrow and tortuous. From this place the steamer returned to Churchill, and then proceeded over to the west coast of the bay and Marble Mountain, arriving at the latter place in the middle of August. After observations on the west side of the bay and island, a determination was made of the position of Cape Southampton, and it was found that the cape is placed on the charts six or seven miles too far south and east. On arriving back at Diggs Island, an inner channel, apparently affording a mode of access clear through to the bay, was discovered. From Diggs Island the *Alert* went to Nottingham, and thence to North Bluff and Stupart's Bay. At the latter a party was sent to make a general observation of Prince of Wales Sound. Observer Payne, who was stationed here, reported finding some relics of very ancient guns. There were four altogether, two of them about the size of nine-pounders of the present day, the other two the size of the four or six pounders. They are of cast iron which is covered with rust; and so old are they, that the year-marks have rusted out, and it is impossible to estimate their age. The two smaller guns were brought home, the others being left behind. Inquiries concerning the guns were made among the Eskimo, but they could tell nothing whatever about them. They were undoubtedly some of the very earliest attempts at cast-iron ordnance. The steamer left Stupart's Bay in the middle of September for Port Burwell. On the way north from Port Burwell, soundings were taken, and the water to the east and south of Cape Chidley found to be very shoal. One bank, where there is less than one hundred fathoms all over it, extends seventy-five miles into the sea; while in the centre of the straits, between the Buttons and Cape Best, there is a depth of over two hundred and fifty fathoms. Returning to Nachvak, the station that could not be reached before, the observers were taken on board, and the *Alert* was headed homeward. The returned observers are all in excellent health, and all save one fared excellently during their exile. At most places game of various kinds was so plentiful that the men rarely tasted the salted or preserved beef.

— Trübner & Co. announce for the coming season, 'Luck or cunning,' as the main means of organic modification,' by Samuel Butler; 'The life and works of Giordano Bruno;' 'The prehistory of the north,' by the late J. J. A. Worsaae (translated, with a brief memoir of the author, by

H. F. Morland Simpson); 'Sources of the Etruscan and Basque languages,' by Robert Ellis; 'Greeko-Slavonic literature, and its relation to the folk-lore of Europe during the middle ages,' by M. Gaster; 'Garibaldi, recollections of his public and private life,' by Elpis Melena (translated from the German by Charles Edwardes); 'Air analysis,' by J. A. Wanklyn and W. J. Cooper; 'For happiness,' by Alexander Calder; 'The Indian empire, its people, history, and products,' by W. W. Hunter; 'Miscellaneous essays on subjects connected with the Malay peninsula and the Indian Archipelago,' edited by R. Rost; 'Manava-dharma-castra, the code of manu,' by J. Jolly; 'The life of Hsien Tsiang,' by the Shamans Hwui Li and Yen-Tsung, with a preface containing an account of the works of I-Tsing by Samuel Bael; 'A sketch of the modern languages of Oceanica,' by R. N. Cust; 'Phantasms of the living,' by Edmund Gurney, Frederick W. H. Myers, and Frank Podmore; 'Al Beruni's India,' and translation of the above into English, by Edward Sachau; 'The social history of the races of mankind,' by A. Feathermann; 'A dictionary of the Targumin, the Talmud Babli and Yerushalmi, and the Midrashic literature,' compiled by M. Jastrow; 'Dictionary of the Kongo language as spoken at San Salvador, the old capital of Congo,' with an introduction by R. N. Cust, and 'A grammar of the Kongo language,' by W. Holman Bentley; 'South-African butterflies,' by Roland Trimen; 'Reports of the archaeological survey of southern India,' by James Burgess; 'The imperial gazetteer of India,' by W. W. Hunter; 'Shall Russian treachery win the day?' by James Samuelson; 'Shropshire folk-lore,' edited by Charlotte Sophia Burne, from the collections of Georgina F. Jackson; 'Language, as illustrated by Bible translation,' by Robert Needham Cust; 'The church and the stage,' by William Henry Hudson; 'A condensed Russian grammar,' by F. Freeth; 'A B C dictionary to the United States, Canada, and Mexico,' by B. Bradshaw; 'Dorn's code for commercial telegrams,' compiled by Felix Dorn; 'A Romanised Japanese reader,' by Basil Hall Chamberlain; 'The Sinhalese hand-book in Roman characters,' by C. Alwis; 'The tropical agriculturist,' compiled by A. M. and J. Ferguson; 'Indian poetry,' by Edwin Arnold; 'Colloquial Portuguese, or, The words and phrases of everyday life,' by Alexander J. D. O'Orsey; 'Elementary bandaging and surgical dressing,' by Walter Pye.

— Messrs. Ticknor & Company announce for publication on Wednesday, Oct. 13, 1886, 'Self-consciousness of noted persons,' by Hon. J. S. Morrill. The senator from Vermont has in this

work condensed the fruits of years of research in an unfamiliar field. A small edition was privately printed some time since, and met with such praise, that Senator Morrill has since revised it for publication. They also announce 'The Virginia campaign of General Pope in 1862,' being vol. ii. of papers read before the Military historical society of Massachusetts; and 'The house at High Bridge,' by Edgar Fawcett.

— From the Cambridge University press the following new publications are announced: 'A history of the theory of elasticity and of the strength of materials, from Galilei to the present time,' vol. i. ('Galilei to Saint-Venant, 1639-1850'), by the late I. Todhunter, edited and completed by Karl Pearson; 'Lectures on the physiology of plants,' by S. H. Vines; 'Travels in northern Arabia in 1876 and 1877,' by Charles M. Doughty (with illustrations); 'The scientific papers of the late Prof. J. Clerk Maxwell,' edited by W. D. Niven.

— Three persons in one family were poisoned in Brooklyn last week by eating unwholesome cheese. It is reported that cheese obtained from the same factory has caused sickness in two other Brooklyn families. The matter is now being investigated by the board of health.

— Another death occurred recently in a Brooklyn dentist's office while ether was being administered. The dentist has been brought to court, and the case will be judicially investigated next week.

— The New York state board of health has found two samples of cream-of-tartar adulterated with oxalic acid. The entire stock of the article has been seized in both the stores where the samples were found, and, if the manufacturers can be found, they will be prosecuted.

— *Nature* states that the International geodetic conference will assemble in Berlin on Oct. 20. Its principal business will be to deliberate on the best method of executing the resolutions arrived at at Rome and Washington in 1883 and 1884, respecting the actual measurement of a degree on the earth's surface, and likewise in reference to a scientific survey of the European continent. The adoption by all nations, of Greenwich as the first meridian, in accordance with the decision taken at Washington, is to be strictly enforced in practice. The introduction of international normal time, on the other hand, has had to be postponed, owing to insuperable practical difficulties connected with ordinary business life. In order to promote the project of any international survey of the entire globe, it is proposed to establish a central geodetic office in Berlin.

—Prof. William Ferrel, recently connected with the signal service, has resigned his position, and removed to Kansas City, Mo.

—It is proposed to hold a meeting of the various scientific societies in Australia and New Zealand in 1888 (the one hundredth anniversary of the foundation of those colonies) upon the lines of the British association meetings, and to form an Australian association for the advancement of science with similar aims and objects. There are some twenty scientific societies in the Australasian colonies, and the number of members is between twenty-five hundred and three thousand. The sections proposed are, A, astronomy, mathematics, physics, and mechanics; B, chemistry and mineralogy; C, geology and paleontology; D, biology; E, geography; F, economic and social science and statistics; G, anthropology; H, medical and sanitary science; I, literature and the fine arts; J, architecture and engineering. In addition to the general and sectional meetings for reading and discussing papers, etc., it is proposed that excursions should be organized to various places of interest, such as the various mining districts, the Jenolan, Wambeyan, and other caves, the Blue Mountains, and similar places of interest to geologists and others. A preliminary circular signed by A. Liversidge of the University of Sydney has been issued.

—The September number of the *Political science quarterly* is largely devoted to economics. Prof. Henry C. Adams of Cornell has a learned article on 'American war financiering,' in which he criticises, from a theoretical stand-point, Secretaries Gallatin, Dallas, and Chase. Hon. Alfred E. Lee writes very clearly and strongly concerning 'Bimetallism in the United States,' showing in a way that even 'cheap money' advocates should be able to understand the real status and effect of our silver coinage. Prof. Richmond M. Smith of Columbia, who described the state bureaus of labor statistics in an earlier number of the *Quarterly*, now reviews favorably the first annual report of the national commissioner of labor. Dr. Bowen continues his interesting account of the conflict in Egypt, and Dr. C. B. Spahr discusses the 'Taxation of labor.' The department of book reviews is unusually full; and the notices of Gneist's 'Das Englische parlament' by Mr. Goodnow, of von Treitschke's 'Deutsche geschichte im neunzehnten jahrhundert' by Prof. Munroe Smith, and of a group of books on constitutional law by Professor Burgess, are of more than passing value.

—Dr. Shakespeare of Philadelphia has just returned from Europe, where for a year he has been

investigating cholera. He has studied the disease in Spain, France, and Italy. During his absence, he also visited India to observe the disease in its home. As Dr. Shakespeare was sent out by the President, his report will be made to him, and forwarded to congress at its next session. From the little that we have been able to learn of Dr. Shakespeare's opinions, we infer that he agrees in the main with Koch and his German collaborators, and that he regards the comma bacillus as a diagnostic sign of the existence of cholera.

—The next meeting of the National academy of sciences will be held in Boston at the Institute of technology, to begin Tuesday, Nov. 9, at noon.

LETTERS TO THE EDITOR.

***Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

Education and the cost of living.

I AM glad that your timely comment on education and the cost of living (*Science*, viii. 313) seconds the proposed abolition of tuition-fees at Columbia college, in the case of graduate students, as 'a step in the right direction,'—one which 'we trust . . . will be taken, . . . and followed by other institutions.' It is but just to add, that Cornell, possibly first and alone among our great universities, has the honor of having already taken this step, 'lo, these many years;' that even in her days of poverty, as now in her prosperity, her library, laboratories, and lecture-rooms have been open to all college graduates who would make good use of them; and there has been no charge except for breakage and for supplies consumed.

But the Cornell experience apparently confirms your thought, that "more efficient and advantageous . . . is the foundation of numerous graduate scholarships and fellowships." We have had here such fellowships for more than two years; and, though there are only eight, their effect in raising the standard of both graduate and undergraduate work is, I think, quite marked.

If the proper business of a university be to improve the community's intellectual and educational ideals by developing in young people that have already some general culture the power of independent, well-directed investigation, of course the presence of earnest graduate students can hardly be too much encouraged.

J. E. OLIVER.

Cornell university, Oct. 11.

The genesis of the diamond.

I send you the following abstract of a paper read by me at the Birmingham meeting of the British association for the advancement of science, September, 1886, in the hope that it may interest your readers.

The discovery of diamonds at Kimberley, South Africa, has proved to be a matter, not only of commercial, but of much geological interest. The conditions under which diamonds here occur are unlike those of any other known locality, and are worthy of special attention.

The first diamond found in South Africa was in 1867, when a large diamond was picked out of a lot

of rolled pebbles gathered in the Orange River. This led to the 'river-diggings' on the Orange and Vaal rivers, which continue to the present time.

In 1870, at which time some ten thousand persons had gathered along the banks of the Vaal, the news came of the discovery of diamonds at a point some fifteen miles away from the river, where the town of Kimberley now stands. These were the so-called 'dry diggings,' at first thought to be alluvial deposits, but now proved to be volcanic pipes of a highly interesting character. Four of these pipes or necks, all rich in diamonds, and of similar geological structure, were found close together. They have been proved to go down vertically to an unknown depth, penetrating the surrounding strata.

The diamond-bearing material at first excavated was a crumbling yellowish earth, which, at a depth of about fifty feet, became harder and darker, finally acquiring a slaty blue or dark green color and a greasy feel, resembling certain varieties of serpentine. This is the well-known 'blue ground' of the diamond miners.

It is exposed to the sun for a short time, when it readily disintegrates, and is then washed for its diamonds. This blue ground has now been penetrated to a depth of six hundred feet, and is found to become harder and more rock-like as the depth increases.

Quite recently, both in the Kimberley and DeBeers mines, the remarkable rock has been reached which forms the subject of the present paper. The geological structure of the district, and the mode of occurrence of the diamond, have been well described by several observers.

As Griesbach, Stow, Shaw, Rupert Jones, and others have shown, the diamond-bearing pipes penetrate strata of carboniferous and triassic age, the latter being known as the Karoo formation.

The Karoo beds contain numerous interstratified sheets of dolerite and melaphyr, also of triassic age, the whole reposing upon ancient mica schists and granites. The careful investigations of Mr. E. J. Dunn demonstrate that the diamond-bearing pipes enclose fragments of all these rocks, which fragments show signs of alteration by heat. Where the pipes adjoin the Karoo shales, the latter are bent sharply upwards, and the evidence is complete that the diamond-bearing rock is of volcanic origin and of post-triassic age.

The diamonds in each of the four pipes have distinctive characters of their own, and are remarkable for the sharpness of their crystalline form (octahedrons and dodecahedrons), and for the absence of any signs of attrition. These facts, taken in connection with the character of the blue ground, indicate, as Mr. Dunn has pointed out, that the latter is the original matrix of the diamond.

Maskelyne and Flight have studied the microscopical and chemical characters of the blue ground, and have shown that it is a serpentinic substance containing bronzite, ilmenite, garnet, diallage, and vaalite (an altered mica), and is probably an altered igneous rock, the decomposed character of the material examined preventing exact determination of its nature. They showed that the diamonds were marked by etch figures analogous to those which Prof. Gustav Rose had produced by the incipient combustion of diamonds, and that the blue ground was essentially a silicate of magnesium impregnated with carbonates.

The blue ground often contains such numerous

fragments of carbonaceous shale as to resemble a breccia. Recent excavations have shown that large quantities of this shale surround the mines, and that they are so highly carbonaceous as to be combustible, smouldering for long periods when accidentally fired. Mr. Paterson states that it is at the outer portions of the pipes where the blue ground is most heavily charged with carbonaceous shale that there is the richest yield of diamonds.

Mr. Dunn regards the blue ground as a decomposed gabbro, while Mr. Hudleston, Mr. Rupert Jones, and Mr. Davies regard it as a sort of volcanic mud. Mr. Hudleston considers that the action was hydrothermal rather than igneous, the diamonds being the result of the contact of steam and magnesian mud under pressure upon the carbonaceous shales, and likens the rock to a 'boiled plum-pudding.'

The earlier theories as to the origin of the diamond have, in the light of new facts, quite given way to the theory that the diamonds were formed in the matrix in which they lie, and that the matrix is in some way of volcanic origin, either in the form of mud, ashes, or lava.

The exact nature of this matrix becomes, therefore, a matter of great interest. The rocks now to be described are from the deeper portions of the DeBeers mine, and were obtained through the courtesy of Mr. Hedley. They are quite fresh, and less decomposed than any previously examined. Two varieties occur, — the one a diamantiferous, the other free from diamonds, — and the lithological distinction between them is suggestive. The diamantiferous variety is crowded with included fragments of carbonaceous shale, while the non-diamantiferous variety is apparently free from all inclusions, and is a typical volcanic rock.

Both are dark, heavy, basic rocks, composed essentially of olivine, and belong to the group of peridotites. Both are of similar structure and composition, differing only in the presence or absence of inclusions. The rock consists mainly of olivine crystals lying porphyritically in a serpentinic ground-mass.

The olivine is remarkably fresh, and occurs in crystals which are generally rounded by subsequent corrosion. The principal accessory minerals are biotite and enstatite. The biotite is in crystals, often more or less rounded, and sometimes surrounded by a thin black rim, due to corrosion. Similar black rims surround biotite in many basalts. The biotite crystals are usually twinned according to the base. The enstatite is clear and non-pleochroic. Garnet and ilmenite also occur, the latter often partly altered to leucoxene. All these minerals lie in the serpentinic base, originally olivine. This rock appears to differ from any heretofore known, and may be described as a saxonite porphyry.

The diamond-bearing portions often contain so many inclusions of shale as to resemble a breccia, and thus the lava passes by degrees into tuff or volcanic ash, which is also rich in diamonds, and is more readily decomposable than the denser lava.

It seems evident that the diamond-bearing pipes are true volcanic necks, composed of a very basic lava associated with a volcanic breccia and with tuff, and that the diamonds are secondary minerals produced by the reaction of this lava, with heat and pressure, on the carbonaceous shales in contact with and enveloped by it.

The researches of Zirkel, Bonney, Judd, and others, have brought to light many eruptive peridotites, and

Baubree has produced artificially one variety (lherzolite) by dry fusion, but this appears to be the first clear case of a peridotite volcano with peridotite ash.

Perhaps an analogous case is in Elliot county, Kentucky, where Mr. J. S. Diller has recently described an eruptive peridotite which contains the same accessory minerals as the peridotite of Kimberley, and also penetrates and encloses fragments of carboniferous shale, thus suggesting interesting possibilities.

H. CARVILL LEWIS.

The eccentricity theory of the glacial period.

I desire to add a supplementary note to my letter of Aug. 16, published in the issue of *Science* for Aug. 27.

In that letter I called attention to the contrast between the northern and the southern hemisphere in respect of glaciation, as tending to show, that, other things being equal, a climate of means (mild winters and cool summers) is more favorable to the accumulation of snow and ice than a climate of extremes (cold winters and hot summers). The bearing of this proposition upon the eccentricity theory is pointed out in my letter.

I now wish to call attention to another well-known geographical fact, which seems to confirm the conclusion that glaciation is favored by a climate of means rather than by a climate of extremes. I refer to the altitude of the snow-line in torrid, temperate, and frigid zones respectively. At the equator the snow-line falls below the annual isothermal plane of 32° F.; while, as we recede from the equator, the snow-line rises above the plane of 32°. So far does the snow-line rise above the isothermal plane of 32°, as we go polewards, that, while the latter plane reaches the sea-level not far from 60° latitude, it has been doubted whether in the northern hemisphere the snow-line anywhere reaches the level of the sea. According to J. D. Forbes, "the mean temperature at the snow-line near the equator is 34.7°; in the temperate zone it is 25.3°; in the arctic regions, about 21°" (Johnston, *Physical atlas of natural phenomena*, Edinburgh and London, 1856, p. 33). While all such numerical statements of the temperature of the snow-line in different latitudes can be considered only rough approximations, there can be no doubt of the general law that (apart from local abnormalities) the temperature of the snow-line falls as we go from the equator towards the poles. Now, it is also true that the annual range of temperature increases from the equator to the poles. At the snow-line near the equator, the extreme summer temperature is but little above the freezing-point; while at the snow-line in the arctic regions, though the mean temperature for the year falls several degrees below freezing point, the extreme summer temperature rises far above it. The comparison of the zones of climate leads, accordingly, to the same conclusion as the comparison of the northern and southern hemispheres. The existence of perpetual snow is shown by both comparisons to depend less upon cold winters than upon cool summers.

A very simple *a priori* consideration suggests the probability of the same conclusion which we have drawn from geographical facts. It seems probable, *a priori*, that extreme winter cold cannot greatly increase the amount of snow-fall. So long as the temperature of any place keeps below 32°, the precipitation will be all in the form of snow; and this

will be the case when the temperature is but little below 32°, as truly as when it falls far below zero.

Cooling a mass of air from 32° to a lower temperature can produce but little additional precipitation, since the maximum vapor tension at 32° is very little, and the change of maximum vapor tension corresponding to changes of temperature in the lower part of the thermometric scale is very slight. The influx of warm and moist air bearing supplies of vapor is not favored by extreme winter cold, since such extreme cold tends to increase barometric pressure over the area affected. On the other hand, every degree that the summer temperature rises above 32° shows an effective increment of the melting-power of the summer sun. The inference would seem to be justified, that, in any place where the annual mean temperature is below or not much above 32°, the more nearly the extreme summer and winter temperatures approach the annual mean, the greater will be the tendency (other things being equal) to the accumulation of perpetual snow. This *a priori* inference seems to be in exact accord with the geographical facts referred to in this and in my former letter.

WILLIAM NORTH RICE.

Wesleyan university, Oct. 8.

The theory of utility.

In connection with the suggestive article in *Science* of Oct. 1, on 'Launhardt's Mathematical economics,' I would like to offer a new theory of utility, or, rather, to discuss it from a new standpoint, and indicate what I consider to be the error in Jevons's main premise.

Utility, or usefulness, is the satisfying of desires. Desires are always in the present, though many, perhaps the most of them, have a prospective nature. Usefulness is not the capacity or capability of being useful: it is the state or quality of *being* useful. It involves, not a possible, but an actual satisfying of desires: e.g., on a certain day a loaf of bread would have possessed utility for Robinson Crusoe in satisfying his hunger; a second loaf would have possessed utility, not in satisfying the hunger of the morrow, but in satisfying his desire to have the possible wants of the future provided for.

If utility be defined as a capacity to serve man or to satisfy his desires, and by this is meant something quite different from the actual satisfying, it serves no purpose of distinction, for with this definition, when affirming utility to be an attribute of any thing, we must always add, 'under certain circumstances; and there is probably not a thing in existence but what, under certain circumstances, possesses this capacity.'

The confusion prevailing as to the nature of utility has arisen from the fact, that, in discussions upon the subject, the provident trait in man's character has been entirely neglected; for from this trait spring desires which are, indeed, of a prospective nature, but whose satisfaction involves utility as indubitably as does the satisfaction of his physical needs.

Utility being of the present moment, time is not one of its dimensions, as the theory of 'final degree of utility' necessarily presupposes. When Jevons ('Theory of political economy,' p. 51) declares that "utility may be treated as a *quantity of two dimensions*, — one dimension consisting in the quantity, and another in the intensity of the effect produced upon the consumer," — it is clear that the supposed dimension of quantity does not have reference to the

mass simply, but to the duration of the commodity, to the time elapsing while it is being consumed.

The theory of varying degrees of utility seems to have its origin in the fact, that, assuming the provident trait to be perfectly developed, the intensity of our desires of a prospective nature varies with our estimate of probable utility, the probability decreasing as the length of time estimated to ensue before the anticipated satisfaction increases; Jevons's chapter on the 'Theory of utility,' with the necessary changes in phraseology, would furnish an excellent discussion on the subject of desires of a prospective nature, which *do* have two dimensions,—one the estimated intensity of the anticipated satisfaction, the other its probability as affected by the length of time to elapse before its estimated occurrence.

But when we enter upon discussion as to the sources of desires, and how desires may be modified, we must say, with Pascal, "C'est un cercle infini, dont le centre est partout la circonference nulle part."

A. E. ROGERS.

Orono, Me., Oct. 5.

Earthquake sounds.

Does any one attempt to offer an explanation for the sound that preceded and accompanied the late earthquake, or earthquakes in general, where the sounds are noticeable? I supposed it was presumable that they were due to the commotion in the earth's crust caused by the radiating waves. But how can that be, when the earth-waves move six to eight times faster than sound-waves? If that be so, would it not appear as if the sound-waves ought in part to come up after the shock has passed? I was asleep when the first and heaviest shock first reached this place (six miles west of Greensborough, in Guilford county), so I cannot tell to what extent the sound preceded the shock. There were two subsequent shocks which were preceded by low roaring and rumbling, so that we predicted the coming of the earth-waves. I said to my wife, 'Now we will have another shake;' and we waited probably three seconds after I had spoken, when the house began to rock. I do not expect you to write me personally, as you will not likely have time, but, if my question should be worthy of note, perhaps some of the geologists of your company could give us a line through *Science*. JOSEPH MOORE.

New Garden, N.C., Oct. 6.

Unexplained noises.

Your comment on mysterious noises in *Science* for Oct. 1 recalls to my memory a very remarkable instance of the transmission of sound and motion.

On the 14th of February, 1862, I was working with my father in his sugar orchard ten miles west of Madison, Ind., and five miles north of the Ohio River. During the entire morning, which was warm, cloudy, and calm, we heard most distinctly the discharges of heavy artillery. The reports would often follow in quick succession. I, as most lads would have been in similar circumstances, became thoroughly alarmed. I felt quite sure that the whole confederate army was close upon us, since the source of the cannonading seemed to be no farther south than the river.

I finally prevailed upon my father to go home, where we found the inmates of the house greatly alarmed at the noises and the rattling of the windows. The shocks, as I remember them, were much like the slight earthquake disturbances experienced lately in

different parts of the country. For several miles along the river these noises were heard and the shocks felt. Nevertheless the day passed, and no invading foe appeared. The morrow brought the news of the bombardment of Fort Donelson.

When it is remembered that Fort Donelson is more than two hundred miles from the locality just described, it is certain that these concussions could not have been carried through the air.

I have been told that the limestone formation coming to the surface along the right bank of the river in Jefferson county, Ind., is the same as that on which Fort Donelson rests. The cannonading which was heard so distinctly that day by hundreds of people in Indiana occurred at Fort Donelson, and the sound-waves were conveyed entirely across Kentucky, and probably at a considerable depth below the surface, by a continuous ledge of limestone. I have thought the phenomena above described worthy of record in your columns.

H. W. WILEY.

Fort Scott, Kan., Oct. 8.

How astronomers may work.

In your editorial of Sept. 24, referring to Professor Pickering's plan for making the Harvard college observatory useful to all other observatories, and to astronomers all over the world, you also notice a plan of my own, which I formulate as follows:—

"We mean to put the large telescope (of the Lick observatory) at the disposition of the world by inviting its most distinguished astronomers to visit us one at a time, and by giving to them the use of the instrument during certain specific hours of the twenty-four. In this way we hope to make the gift of Mr. Lick one which is truly a gift to science, and not merely one to California and to its university."

Your comment on this plan is that you suspect that Professor Holden 'was hard-pressed to devise it.'

I trust that your impression will not be shared by Professor Young, if he remembers the discomforts of his expedition to Sherman; or by Professor Langley, if he recalls the hardships of his own to Mount Whitney; or by Dr. Huggins, when he recollects the hundreds of failures which have come in his delicate researches in spectroscopy and photography from the London climate; or by Mr. Burnham, when he remembers how many of the double stars which he discovered at Mount Hamilton with a six-inch telescope were 'difficult' in Chicago with one of eighteen inches. Not to mention any other names, I am sure that these astronomers will feel a sense of gratitude when the facilities of the Lick observatory and the opportunities of its climate are put at their disposition, and will attribute the offer to a generous desire to forward science, and not to a scheme to eke out a scanty income. As a matter of fact, I have directed the policy of the observatory since 1874, and it is a pleasure to me to be able in 1886 to announce a plan which has been constantly in my thoughts for more than ten years, and which seems to me to be a long step in the true direction. I trust it will also seem to be such to my fellow-astronomers. It would have been natural to have looked for the same view from the editor of *Science*; but, as long as the plan commands their respect and my own, it will be carried out. You will have to look to its results to see if it may not eventually command your own also.

EDWARD S. HOLDEN.

Berkeley, Cal., Oct. 2.

SCIENCE.—SUPPLEMENT.

FRIDAY, OCTOBER 15, 1886.

WASHINGTON'S SIGNATURE.

DR. PERSIFOR FRAZER recently published in the Proceedings of the American philosophical society a paper on composite photography as applied to handwriting. One of the most interesting results is that he obtained with the signature of Washington, the facsimiles of which we here reproduce. The difficulties of the process, and the peculiarities of composite signatures, were pointed out in *Science* of Jan. 22.

George Washington's signature was one of the first to suggest itself for the purpose, because many persons were familiar with it, and there are numerous well-authenticated documents in existence which bear it; but it has proved to possess other advantages which were not known when it was selected. As in every thing else, Washington was deliberate, painstaking, and uniform in his method of writing his signature, and the consequence is that it makes an excellent composite for illustration.

In writing his signature, Washington put pen to the paper five times. First he wrote the *G W* in one connected line. Second, he raised his hand and made the small *o* between the upper parts of the *G* and *W*, and the two dots which appear in all but signature No. 7. Third, his hand and arm were placed in position to write *ashing*, these six letters occupying a breadth of almost exactly $1\frac{1}{2}$ inches in every signature except the third, when they are extended to $1\frac{1}{8}$ inches. This is about as much of the arc of a circle (of which the centre is the elbow pivoted on the table) as one with a forearm of average length can cause to coincide with the tangent, or the straight line across the paper which the lower parts of the letters follow, unless unusual effort be made, and a great deal more movement be given to the fingers. The *g* ends in a curved flourish, of which the convex side is turned upwards below the right centre of the name. The lower loop of the *g* in all the signatures and in the composite was cut off in preparing the plate. Fourth, he wrote the final *ton*. Fifth, he added the very peculiar flourish above the right centre of the name, with the object of dotting the *i* and crossing the *t* at the same stroke.

In examining the composite, the effect of these various separate movements becomes manifest in its strengthened portions. It is hardly possible

that any one, during the period of sixteen years which these signatures represent, or from 1776 to 1792, should have so schooled his hand to write a long name that the first inch or so of the writing should always occupy the same relative position to the body of the signature. It would take at least that much action for the hand and arm and pen to be brought into normal signature-writing condition; and especially is this so when this part of the writing is accompanied by flourishes, as it is in the case we are considering. The *G W*, and the little *o*, and the dots at the top, were the prelude, after which the arm was moved into position to write the main body of the signature, or the *ashing*. Of course, from the manner of making the dots, and the extremely small space they cover, their re-enforcement of each other in the composite was almost impossible, and, in fact, like other subordinate characters, they disappear almost completely. This latter is the part of the name which one would have expected to exhibit the greatest amount of uniformity, as in point of fact it does, with the exception of its terminal *g*, which shows more variation than any of the other letters, because at this point the limit of coincidence between the tangent line of the writing and the curve, of which the right fore-arm was the radius, had been passed, and a freer movement of the fingers was compensating for the increasing divergence. It is likely that Washington sometimes raised the hand between the end of the long *s* and the beginning of *h*, but he does not appear to have moved the elbow. All but the second signature are consistent with this view, and in the first, third, and fifth it is plainly indicated. In the others, as in the flourish above the sixth signature, the pen may not have marked. The fourth separate act of the penman was the formation of the *ton* after a movement of the arm. The breadth of the space occupied by these three letters is from $\frac{3}{8}$ to $\frac{7}{8}$ of an inch, or considerably within the range of coincidence of the curve and straight line before referred to; and owing to this fact there is only a moderate degree of re-enforcement of the letters in the composite, because these letters might fall into the first or last parts of the 2-inch space which was the limit of movement with a fixed elbow. It is worthy of note that even in this case the middle letter of the three is darker in the composite than either of the outside letters. The fifth and last movement was the flourish which dots the *i* and crosses the *t* by one stroke. This was done in the freest of free

1 *G. Washington*

2 *G. Washington*

3 *G. Washington*

4 *G. Washington*

5 *G. Washington*

6 *G. Washington*

7 *G. Washington*

8 *G. Washington*

hands ; often, as it seems probable, without resting hand or arm on the table at all. Therefore there is no coincidence of the lines in this part of the composite, and the *region* of variation is wider than that of any other part of the signature.

All the signatures used in the accompanying plate (seven in number) are unquestionably genuine. With the exception of one, which is the property of Dr. Frazer, they were carefully chosen from a number of authenticated signatures in the possession of the Historical society of Pennsylvania.

No. 1 is on a letter dated Dec. 18, 1776, from near the Falls of Trenton, and addressed to Washington's brother Samuel.

No. 2 is on a letter dated Headquarters, Nov. 4, 1777, and is addressed to Lieut.-Col. Persifor Frazer, then a prisoner of war in Philadelphia.

No. 3 is on a letter dated Sept. 27, 1777, and is to William Henry of Lancaster.

No. 4 is the composite of all the rest.

No. 5 is on a letter dated Headquarters in Morristown, Feb. 22, 1777. The person to whom the letter was addressed is not stated.

No. 6, dated Sept. 26, 1793, is affixed to the commission of David Lenox.

No. 7, of the same date, is affixed to David Lenox's appointment as agent for the relief and protection of American seamen.

No. 8, dated May 24, 1799, closes a letter to Thomson Mason.

THE PSYCHOLOGY OF FEAR.

IF a true psychology is physiological, and if the physiological furniture of the world is largely the result of a vast series of experiments of which only the most successful ones have survived, it ought to be possible to find an important useful significance in the thought-habits, the instincts, the will-mechanisms, the emotions of animals, and more especially of man. It was this conviction that set Darwin to work on his 'Expression of the emotions in man and animals.' Among these emotions there is one, very wide-spread in the animal kingdom, as Dr. Romanes has shown ('Mental evolution in animals'), very important to the welfare of the animal, and typical of the suggestive conceptions resulting from the positing of a comparative and a physiological point of view, — the emotion of fear.

M. Charles Richet (*Revue de deux mondes*, July, 1886, pp. 73-118) considers it an apt time for presenting the subject in a popular manner ; and it may be equally worth while to give a short account of the scientific conception of fear, following in the main the article of M. Richet.

Emotions may be considered under two heads, according as they attract or repel the object by

which they are called up. The three chief emotions of the latter class are pain, disgust, and fear. Each of these emotions has a physical and a psychological aspect. We use the word 'pain' to mean the sensation resulting from a cut finger, and the emotion caused by the death of a friend. We can be disgusted by a nauseous concoction, and also morally disgusted at the mean conduct of a supposed friend. There is the paralyzing effect caused by the sudden appearance of a lion, and the dread of a coming examination. As in the other emotions connected with a definite disturbance of the nervous system, there appear in the animal scale and in human development all shades, from the simplest physical reflex to the most elaborated, consciously willed action. But the emotion itself — the fear — can be readily detected in all these varying modes of expression.

Repelling emotions are protective in their function. Pain gives us tidings of the condition of the organism, and thus demands the needed remedy, and averts injury. Disgust warns us of noxious substances. The object of fear is to advertise and escape danger to life. It would not do to leave the danger to be avoided by a reasoned action : there would be no time to form syllogisms. Nature puts the emotion first, and the reasoning afterwards. The chickens would soon disappear if they had not an instinctive fear of the fox. There is, then, a simple form of the emotion which expresses itself by an unreasoned, involuntary reflex action. These effects are well shown by the typical picture of terror, — the pale features, the limbs fixed powerless to move, trembling, chattering of teeth, altered heart-beat, gasping breath, cold perspiration, etc. These paralyzing effects of fear may reach a dangerous intensity, and produce death by arresting the activity of the heart. The story told by Dr. Lauder Brunton, of an instructor who had made himself obnoxious to the college students, and, after being blindfolded, was subjected by them to a process imitating death by decapitation, and found to be really frightened to death, is a case in point. It is said that condemned criminals are often nearly dead with fright before the instrument of death is applied. These physical effects of fear are best seen in the lower animals. The fear most commonly felt by us shows itself in what may be called a psychic reflex. In this case the sense stimulus is interpreted, and then the reflex expression of fear follows. If during a performance the rope of a trapeze breaks, the sensations by which that fact is made known are at once interpreted as a threatening danger, and by the force of sympathy fear will possess the spectators as well as the performer. Of course, this is not a natural stimulus.

It has already been noticed that the effect of fear may be of two kinds, — either exciting or paralyzing. The process by which this paralyzing is effected is inhibition. The spinal cord ministers to the reflex acts of the organism; the brain, to the voluntary and automatic. A stimulation of the higher centre may arrest the function of the lower. This probably is to some extent the normal condition, for the reflexes of a frog are more intense if the brain is removed. The will can delay or inhibit reflexes. We can keep back a cough or a cold. Over other reflexes the will has less control. Few can refrain from winking when a body is moved towards the eyes (Pliny records that gladiators were tested in this way). This psychic reflex is characterized by the fact that its intensity depends little on the intensity of the stimulus (as pain, for instance, does), but almost exclusively on the individuality of the subject. The person with a timid temperament is more readily and intensely frightened. Women, children, nervous persons, are disposed to fear. So, too, animals whose only defence is a rapid flight (hares, rats) are naturally timid, while aggressive beasts of prey are brave. Even the momentary condition, whether before or after dinner, will vary the intensity of fear. There are two psychic agencies which, *par excellence*, increase fear: they are imagination and attention. The man of vivid imagination who walks along a dark road will have many more frights than his prosaic companion. The fixation of the attention which expectation causes increases the fear. The ghost expected just at midnight is more terrible than an unexpected visitor. The emotion of fear depends, thus, on individual organization, and is not under the control of the will. What the will can do is to restrain the expression of the emotion. Courage is power of inhibition. The soldier cannot help being frightened, but he can help running away. The martyr is a hero, because he can inhibit that strongest of instincts, self-preservation.

To return to the teleological point of view, it may be asked to what extent the natural reflexes are useful. What are the best ways of escaping danger? One way is evidently by fleeing. To this corresponds the exciting effects of fear, which furnish the best conditions for speed and activity. Another way is to avoid observation by restraining movement. This is accomplished by the paralyzing effect of fear. The action is seen in its highest development in the death-feigning instincts of certain insects. The explanation of trembling is rather difficult: it certainly seems to be a hurtful action. M. Richet suggests that it is the result of an attempt to arrest motion, but of an attempt not entirely successful. The cry of

fear is perhaps an attempt to startle, and thus give a chance for escape.

Lastly, what are the excitants of fear? One group centres about the fear of death, of pain, and of disfavor. The first is the strongest; the second is active in small affairs; the last is of a more distinctively psychic nature. It is shown in stage-fright, where it may be accompanied by all the physical characteristics above described. Here, too, belong the peculiar sensations of vertigo to which some persons are subject to a pathological extent. It is impossible for them to cross a plank that bridges over a height. Even the bravest are subject to this feeling. That it is mental in its nature is shown, for example, by the fact, that, if a railing be set on the plank, even if too slight to be of any use in case of accident, the feeling may largely subside. It acts as a moral support. Another class of fears is inspired by the unfamiliar, by darkness, and by solitude. What is unfamiliar may be noxious. Caution is a useful trait. The savage and the child typically show this dread of something strange. The fear of ghosts also comes in this category. Darkness doubles fear: it makes things unfamiliar by preventing the use of that sense by which chiefly we recognize objects. Nobody feels perfectly at home in a strange dark room. Animals are more subject to fear at night. Man is naturally a social animal. Solitude is abnormal: it makes protection impossible. This feeling may become pathological: it has received the name of 'agoraphobia,' or the dread of open places.

A word on the power of habit over fear. M. Richet relates how he had occasion to pass frequently through a forest at night. He entered it boldly; but after a few steps the feeling came on, and he felt highly relieved when he saw the clear sky again. Each night he was able to keep up his bold step for a longer and longer distance, until finally the fear was almost overcome. Habit is the only method of removing fear. Workmen in powder-mills know they are in constant danger, but have no fear. To educate a child to be brave, the habit of not fearing darkness and solitude, and so on, must be gradually taught. J. J.

GEOLOGY OF LONG ISLAND.

THE current volume of *Annals of the New York academy of sciences* contains an article on the 'Geology of Long Island,' by F. J. H. Merrill, giving much definite and historical information. Mather first described it in the State natural history survey, 1842; Upham studied its moraines, in connection with those of Cape Cod, in 1879; Lewis has at various times examined its fossil-

bearing sands and its curious topography, one element of the latter being the continuation of certain of its water-courses southward under the sea for a little distance from shore; and Russell has confirmed the suggestion that the streams cut their right banks more than the left, as if in obedience to von Baer's law. Merrill briefly refers to the archæan rocks at the western end of the island, and devotes more space to sections of the probably cretaceous and tertiary clays and sands of the northern shore, and to the drift. He emphasizes the thinness of the till at many points along the range of hills or 'backbone' of the island, and ascribes a good part of their height to the upheaval of the bedded deposits, which largely compose them, by the thrust of the ice. Thus marine fossils may be lifted to greater elevation above the sea than can be ascribed to continental emergence. All along the north shore of the island, the bedded gravels, sands, and clays are found upheaved, and thrown into a series of distinct folds at right angles to the line of glacial advance. On Gardiner's Island the folds are remarkably prominent in the form of numerous parallel ridges, trending east-north-east. This recalls Johnstrup's explanation of the distortion of cretaceous beds on the Danish islands of Møen and Rügen by the thrust of Scandinavian ice, and the observations of Credner and others on the distorted subglacial beds of northern Germany. The bays on the northern side of Long Island are thought to be excavations made by lobes of ice projecting for a time beyond the general line of glacial front. The highest hills of the 'backbone' are in line with these bays, as if gaining in height by the excess of pressure there; and channels, also in line with the bays, break through the hills, as if they had been kept open by the discharge of water from the ice.

ELY'S LABOR MOVEMENT IN AMERICA.

THAT curiously heterogeneous mass of circumstances and events which is included under the general designation 'labor movement' has given rise to a large literature, much of it polemic, some historical and critical, some constructive. It has engaged the attention and study of many scholars, and perhaps of all the more progressive students and teachers of economics and political science. Among the latter, none has been more painstaking in his research, nor more frequent in his writings, than Prof. Richard T. Ely of Johns Hopkins university. During the past few years, numerous articles and several books have issued from his pen; and the book before us is partly the outgrowth of

its predecessors, and partly the forerunner, as the author tells us in his preface, of a larger work, to be entitled 'History of labor in the new world.'

It immediately occurs to us to ask, What does Professor Ely mean exactly by the labor movement, what is his attitude toward it, and what does he tell us about it? Fortunately, the style and tone of the book, as well as its definite statements of opinion, permit us to answer all these questions clearly. Stripped of its accessories, the labor movement, in its broadest terms, is 'the effort of men to live the life of men' (p. 3). This sententious aphorism might mean a great many things, inasmuch as it affords great latitude of interpretation. But Professor Ely sharpens it to a point, and interprets it as having an economic significance truly, but, beyond and including that, an ethical import. "It is for self and others. It is the realization of the ethical aim expressed in that command which contains the secret of all true progress, 'Thou shalt love thy neighbor as thyself.' . . . It is an attempt to bring to pass the idea of human development which has animated sages, prophets, and poets of all ages, — the idea that a time must come when warfare of all kinds shall cease; and when a peaceful organization of society shall find a place within its framework for the best growth of each personality, and shall abolish all servitude, in which one 'but subserves another's gain'" (pp. 3, 4).

In contemplating this ideal state, a veritable heaven, Professor Ely grows very enthusiastic, and well he may. On studying the details of the movement which he says has this laudable end in view, however, we are forced to pause, and inquire whether the tendency is really what Professor Ely thinks it is. We are tempted to believe that he has committed the not uncommon scientific error of reading his theory into the facts, instead of deducing it from them. He tells us that the socialist and anarchist organizations have cast off Christianity, and indeed religion generally, yet he preaches Christian ethics as the remedy for the wrongs of which they complain. While not over-clear on this point, yet he seems to uphold the extremists in their contention that all the evils of the present state of society are due to private property and the lack of proper co-operation in production and distribution. But Aristotle, somewhat unfashionable nowadays perhaps, saw deeper than that, and said plainly that the evils ascribed to the institution of private property really flowed from the wickedness of human nature (*Politics*, Jowett's translation, p. 35). And just here we would ask all these labor agitators, sincere and insincere, and their allies among professed economists, to consider whether their suggested remedies

The labor movement in America. By RICHARD T. ELY. New York, Crowell, 1886. 12°.

for industrial evils really reach the root of the trouble. We strongly incline to the belief that they do not, and that the social, political, economic, and ethical elevation of men at large and the human nature that is in them is what is wanted, and not either the regeneration or the extinction of a class.

Professor Ely's facts are very full, and, to the best of our knowledge, generally accurate. After a hasty sketch of early American communistic societies, he takes up in detail the various labor organizations of any importance, and pictures their growth and present condition. Their growth he divides into two periods, — 1800–61 and 1861–86. During the first of these periods, "an increasing number of local unions is formed; at times unions of artisans of various trades in a certain section join hands for common action; gradually the skilled laborers, pursuing the same trade, form the idea of national unions, urged on, doubtless, by the increased facilities of transportation and communication," which caused competition to become national, and not merely local. Since 1861, of course the growth has been much greater: in fact, all the principal labor organizations have arisen since that time; the Grangers having been organized in 1866, the Knights of labor in 1869, and the Federation of organized trades and labor unions in 1881. Professor Ely admits (p. 89) the impossibility of even approximately estimating the number of organized laborers in the United States, at the present time, but considers one million a conservative estimate. Admitting the accuracy of this figure, he cannot fail to recognize the fact, so clearly and so frequently proven during the past year, that their demands are not for the laboring class at large, but for themselves, the small fraction of the whole that is banded together. Furthermore, they have not infrequently trampled under foot men quite as competent and quite as deserving as themselves, simply because they did not belong to the 'union.' It is this selfish feature in the labor organizations that has drawn down upon them opposition and contempt where often they would have had aid and sympathy. 'Individualism run mad' may be bad, but organization run mad is worse.

Professor Ely can hardly be willing to subscribe to all the political aims of the Knights of labor, and indeed expressly says (p. 159) that he is not. Yet he tells us (p. 76) that they are organized for 'the attainment of beneficent public and private reforms.' Their financial programme would only be a reform in the direction of disaster; their denunciation of convict labor is either pure ignorance or else an invitation to the tax-paying population to support criminals in idleness; and the expediency of their

scheme for government control of railways and telegraphs is at least open to serious question, even if not to be absolutely condemned.

What Professor Ely means by his statement (p. 161) that it is not true that laborers work peacefully and contentedly until a mischievous agitator comes along and stirs them up, we do not understand. He certainly must know that numbers of just such cases happened during the spring of the present year. The case of the 'walking-delegate' from Troy stopping a silk-factory in Paterson, and that of the Broadway car-drivers in New York leaving work because an unknown individual snapped his fingers, are perhaps the best known.

We have taken pains to touch upon these seemingly minor points in Professor Ely's book, because it seems to us a book likely to be widely read, both by the laboring classes and by the reading public generally, and for that reason erroneous statements otherwise minor become important. We had marked several other statements for correction, but lack of space compels us to mention but one of them. On p. 286 we read that our "laboring population consists chiefly of men and women of foreign birth or foreign parentage." This is given as the reason why the socialistic societies are composed principally of foreigners, and is presumably intended as a reply to the statement often made, that socialism and communism have no place in the United States, and appeal to very few citizens who are not foreigners by birth. But, as a matter of fact, the census statistics do not uphold Professor Ely's assertion. In 1880 there were engaged in twenty selected occupations 17,392,099 persons. Of this number, 13,897,452 were of native birth, and 3,494,647 of foreign. Moreover, there were only 6,679,943 foreign-born men, women, and children in the country in 1880, and only 5,758,811 of those one or both of whose parents were foreigners.

While criticising these points in Professor Ely's book, we can commend it as a good, clear, and fairly accurate statement of what our labor organizations have done and are doing. Its account of their literature in this country is the best we have seen anywhere. But it must be read with caution; for the author is somewhat of an idealist and a *doctrinaire*, and often lets the demands of his theory blind him to the true nature and tendency of the facts of which he treats.

His insistence on the necessity for an ethical bond in society as well as an industrial one, and for an ethical end toward which all true progress must move, and his sharp condemnation of violence and force in effecting social and industrial changes, are two of the best features of the book.

Somebody — whether author, publisher, or both,

we do not know — is to be severely censured for allowing a book so full of facts and statistics to appear without any index whatsoever. It lessens its value one-half. N. M. B.

FORNANDER'S POLYNESIAN RACE.

THE third volume, recently published, completes this remarkable work, which has a decided and peculiar value, in a scientific sense. This value, however, is not that for which the author himself is most disposed to claim credit. The ethnological and linguistic speculations which occupy his third volume, and on which he has evidently bestowed much labor, will not commend themselves to the judgment of students familiar with such inquiries. But the portions of his work devoted to the history, traditions, and ancient usages of the Hawaiian people, have great interest. The many legendary chants which the author has preserved possess no mean poetical merits. But their chief value is historical; and the conclusions to which they lead have an importance extending far beyond the limits of the field to which the legends relate. One of the most notable results of Mr. Fornander's work, and the one for which it will be perhaps most cited hereafter, is the clear proof which it affords that traditions going back for several centuries may, under certain conditions, be accepted as authentic history. No one who reads these volumes can have any doubt that the Hawaiian annalists are able to give an account of events which have occurred in their islands during a period of at least nine hundred years, and to relate these events with sufficient fulness and accuracy to enable the compiler to make out of them a fair chronological narrative. The genealogies go back some centuries further, but with fewer details and greater uncertainty. The authentic history must be restricted to less than a thousand years; but even within this limit it upsets completely some assumptions which have been confidently maintained by writers of considerable eminence. The notion that no unwritten tradition which goes back more than a century can be trusted is shown to be wholly unwarranted. Those who have maintained it have failed to discern the distinctions which make such traditions trustworthy or the reverse. Much, as we now see, depends upon race. There are races and tribes in whom the historical instinct is strong, as we find it in the Chinese and the Arabians. There are others, like the Hindoos, in whom it seems

almost entirely lacking. The test of its presence appears to be the disposition to preserve genealogies. As among the Arabian tribes, so in all the Polynesian groups, the pedigrees of noted chiefs and of reigning lines are preserved with great care. They are usually thrown into the form of metrical chants, which are easily retained in the memory. The three names of each generation — father, mother, and child — make a verse of the chant. The child whose name concludes one verse is the father (or mother) in the next. In this manner a series of catch-words is maintained throughout, making it impossible to derange the order of the pedigree, and easy to keep the chant in memory. Thus, for example, the later descents of the British royal family, recorded in the Hawaiian fashion, would run as follows:—

George the Third the father, Charlotte the mother, Edward
of Kent the child;
Edward of Kent the father, Victoria the mother, Victoria
the child;
Victoria the mother, Albert the father, Albert Edward the
child;

and so on. It is evident that any one who could learn by heart a hundred lines of verse would easily learn and remember a hundred generations in this singsong. Compared with the Homeric catalogue of ships, it would be a trivial effort of memory; and, where such a chant was known to many persons, any mistake of one reciter would be promptly corrected by others.

Every island and every large district of the Hawaiian group had the pedigree of its ruling family carefully retained and often repeated by the priests and other dependents of the family, as well as by the chiefs themselves. As intermarriages were frequent, these genealogies confirm one another, in a manner which leaves no doubt of their correctness. The more important chiefs of each line have special traditions attached to their names, and recorded frequently, though not invariably, in metrical form. Sir George Grey and other inquirers in New Zealand, and the missionaries in almost every important island of Polynesia, have found similar customs prevailing, and have been able to trace back the histories of the various islands with unquestionable exactness for periods varying from two hundred to a thousand years. The data supplied by Mr. Fornander far exceed in number and value those collected by any other investigator. Their abundance, and the exactness insured by the compiler's habit of judicial scrutiny, make his work the highest authority on this subject, and indispensable to any historical writer who desires to satisfy himself or his readers in regard to the credibility of unwritten traditions, when preserved under certain favorable circumstances.

An account of the Polynesian race: its origin and migrations; and the ancient history of the Hawaiian people to the times of Kamehameha I. 3 vols. By ABRAHAM FORNANDER. London, Trübner, 1878-86. 8°.

Mr. Fornander has also brought to light the evidences of an interesting series of movements which began in the Polynesian Islands about the commencement of the eleventh century of our era, and continued for two or three hundred years. During that period, as he shows us, "the folk-lore in all the principal groups becomes replete with the legends and songs of a number of remarkable men, of bold expeditions, stirring adventures, and voyages undertaken to far-off lands." For seven or eight generations the navigators of the leading groups, from the Sandwich Islands in the north to the Society group in the south, and from the Friendly Islands in the west to the Marquesas in the east, were accustomed to interchange visits, and to voyage freely to and fro, with far more assurance and better seamanship than were displayed by the early Greek and Italian sailors in the Mediterranean. Yet the distances thus traversed sometimes exceeded two thousand miles, and crossed both the north and the south trade-winds and the equatorial belt. These surprising feats of seamanship were performed by people who were still in the stone age, and so far back in that age, in the industrial sense, that they had not even arrived at the invention of pottery. Such facts show, that, in accounting for the movements of population in primitive times, mere distance and difficulties of navigation need hardly be taken into account.

The author has traced with much care the history of the Hawaiian people from the close of that era of unrest and adventure in the thirteenth century, down to the time, in the early part of the present century, when Kamehameha, with the help of foreign arms and auxiliaries, succeeded in uniting all the islands under one government. The whole of this portion of the work is of great interest. The industry and judgment displayed in collecting and sifting evidence secure the reader's confidence. The details which are given concerning the primitive customs and social arrangements of the people have much ethnological value. In passing from this section of the work to that in which the author sets forth his views respecting the origin and affiliations of the Polynesian race, a serious disappointment is experienced. The undoubted success achieved in dealing with the native traditions and other local matters, which were familiar to the writer, deserts him when he ventures into this wider and less-known field. The student of philology, however, will be able to extract even from this portion something that will be useful to him. Ethnologists, while they will find the author's archeological theories and his peculiar etymologies fanciful and unsatisfying, will not allow these minor defects to blind them to the

great and indeed unique value of his work as a treasury of local traditions and customs and a trustworthy historical record.

PACKARD'S FIRST LESSONS IN ZOÖLOGY.

THIS is an abridgment of the larger works by the same author, and is intended for the use of beginners. It contains about two hundred and ninety pages, including glossary and index. It differs from the larger works in the same series in treating of fewer forms, containing much less anatomy, and the general, by no means entire, omission of the embryonic development of the different groups. The general plan of the book, and allotment of space to the different types and classes, is good, although some important groups have been, perhaps necessarily, slighted. Thus only four pages are devoted to vermes. There is the same lack of clearness and exactness in definition so characteristic of the larger text-books in the same series. Thus the definition of 'Coelenterata' contains no reference to the radiate structure of the animals, to tentacles or thread-cells, or to the use of the same cavity for digestion and circulation. Most of these points have indeed been noticed in the general description, but, in summing up the essential characteristics of the type, they are all omitted. The same definition, too, leads us to infer that all Coelenterata pass through a medusoid stage. The definition of 'echinoderms' is hardly more accurate. Those of the higher types are somewhat better, sometimes good. The forty pages devoted to insects are the best part of the book. Each order has its special chapter, in which some important species is described as fully as the size of the book will allow. Any boy or girl who has studied these chapters thoroughly will not only have some knowledge of them, but, what is far more important, will certainly have a new interest in them and a stronger desire to study the different species and find out their habits. The style is clear, and the subjects made interesting. The student's mind is not confused by a mass of details, or by unsatisfactory descriptions of a large number of specimens which he can never expect to see, much less examine; but the brief sketches of a few of the most important forms will awaken in him a desire for wider knowledge. The figures are numerous, averaging almost one to each page; yet they are so well selected, that, while one grudges so much space, he finds few which he would omit. They are clear and well executed.

First lessons in zoölogy. By A. S. PACKARD. New York, Holt, 1886. 12°.